CLAIMS

1. In apparatus for processing elongate material continuously advancing along a processing path by using at least a first pair of cyclically driven tools between which the material passes as it moves along the processing path and which synchronously engage opposite faces of the material and move at the same linear speed as the material when in contact therewith, and return upstream to re-engage the advancing material and repeat the processing cycle, the improvement wherein each tool is cantilevered transversely of the processing path from a tool drive located adjacent a first edge of the processing path.

2. Apparatus according to claim 1, wherein the tool drive for each tool supports the tool for orbital movement around a drive axis that extends transversely of the processing path.

3. Apparatus according to claim 2, wherein each tool is mounted on a tool carrier which is supported by said tool drive and has a tool carrier axis about which the tool carrier rotates, and said tool carrier axis orbits around its respective drive axis.

4. Apparatus according to claim 3, wherein said tool carrier axis and said drive axis are parallel.

5. Apparatus according to claim 4, wherein each tool drive comprises a crank arm having a drive end and a free end, each tool carrier is cantilevered at the free end of its respective crank arm, the drive end of the crank arm is supported for rotation about said drive axis, and all of said tool carrier axes and said drive axes are parallel.

6. Apparatus according to claim 5, wherein each tool has a working face adapted to engage the material, and the tool drives maintain the working faces of the tools in a mutually facing attitude throughout revolution of the tool carriers about their respective drive axes.

7. Apparatus according to claim 6, wherein each crank arm is rotatably driven at its drive end by a drive shaft which is journaled for rotation relative to a fixed shaft coaxial with said drive shaft and said drive axis, the tool carrier has a carrier shaft journaled for

rotation at the free end of the crank arm for rotation about said tool carrier axis, and a timing mechanism operatively interconnects said carrier shaft and said fixed shaft to effect counter-rotation of the carrier shaft relative to the crank arm at the same angular rate so that the attitude of the tool relative to the processing path is fixed.

8. Apparatus according to claim 7, wherein said timing mechanism comprises an endless member interconnecting said carrier shaft and said fixed shaft.

9. Apparatus according to claim 8, wherein said endless member comprises a toothed belt, and said carrier shaft and said fixed shaft are notched to mate with said toothed belt.

10. Apparatus according to claim 8, wherein said endless member comprises a chain, and said carrier shaft and said fixed shaft have sprockets which mate with said chain.

11. Apparatus according to claim 7, wherein said timing mechanism comprises a gear train.

12. Apparatus according to claim 1, wherein each tool is mounted on a tool carrier, each tool drive comprises a crank arm having a drive end and a free end, each tool carrier is cantilevered at the free end of its respective crank arm, and the drive end of the crank arm is supported for rotation about a drive axis that extends transversely of the processing path.

13. Apparatus according to claim 1, further comprising a second pair of cyclically driven tools between which the material passes as it moves along the processing path and which synchronously engage opposite faces of the material and move at the same linear speed as the material when in contact therewith, and return upstream to re-engage the advancing material and repeat the processing cycle, each tool of said second pair being cantilevered transversely of the processing path from a tool drive located adjacent a second edge of the processing path which is opposite said first edge.

14. Apparatus according to claim 13, wherein the drive for each tool of said second pair supports the tool for orbital movement around a drive axis that extends transversely of the processing path.

15. Apparatus according to claim 14, wherein the drive axes for each set of two tools which act on the same face of the material are coaxial so that said two tools of each said set travel in the same orbital path, and wherein the first and second pairs of tools are synchronously operated out of phase so that they engage the material at different times and do not interfere with each other.

16. Apparatus according to claim 15, wherein said first and second pairs of tools are operated independently.

17. Apparatus according to claim 16, wherein said first and second pairs of tools are operated by separate servomotors.

18. Apparatus according to claim 14, wherein each tool is mounted on a tool carrier, each tool drive comprises a crank arm having a drive end and a free end, each tool carrier is cantilevered at the free end of its respective crank arm, and the drive end of the crank arm is supported for rotation about said drive axis.

19. Apparatus according to claim 18, wherein each tool carrier has a tool carrier axis about which the tool carrier rotates, and all of said tool carrier axes and said drive axes are parallel.

20. Apparatus according to claim 19, wherein the drive axes for each set of two tools which act on the same face of the material are coaxial so that said two tools of each said set travel in the same orbital path, and wherein the first and second pairs of tools are synchronously operated out of phase so that they engage the material at different times and do not interfere with each other.

21. Apparatus according to claim 20, wherein each tool has a working face adapted to engage the material, each crank arm is rotatably driven at its drive end by a drive shaft which is journaled for rotation relative to a fixed shaft coaxial with the respective drive shaft and the respective drive axis, each tool carrier has a carrier shaft journaled for rotation at the free end of the respective crank arm for rotation about the respective tool carrier axis, and a timing mechanism operatively interconnects said carrier shaft and said

fixed shaft to effect counter-rotation of the carrier shaft relative to the crank arm at the same angular rate so that the attitude of the tool relative to the processing path is fixed, whereby the working faces of each of said pairs of tools remain in a mutually facing attitude throughout revolution of the tool carriers about their respective drive axes.

22. Apparatus according to claim 21, wherein said timing mechanism comprises an endless member interconnecting said carrier shaft and said fixed shaft.

23. Apparatus according to claim 22, wherein said endless member comprises a toothed belt, and said carrier shaft and said fixed shaft are notched to mate with said toothed belt.

24. In apparatus for processing an elongate film tube continuously advancing along a processing path by using at least a first pair of cyclically driven tools between which the tube passes as it moves along the processing path and which synchronously engage opposite faces of the tube and move at the same linear speed as the tube when in contact therewith, and return upstream to re-engage the advancing tube and repeat the processing cycle, the improvement wherein each tool is cantilevered transversely of the processing path from a tool drive located adjacent a first edge of the processing path.

25. Apparatus according to claim 24, wherein each tool is mounted on a tool carrier, each tool drive comprises a crank arm having a drive end and a free end, each tool carrier is cantilevered at the free end of its respective crank arm, and the drive end of the crank arm is supported for rotation about a drive axis that extends transversely of the processing path.

26. Apparatus according to claim 25, wherein each tool carrier has a tool carrier axis about which the tool carrier rotates, and all of said tool carrier axes and said drive axes are parallel.

27. Apparatus according to claim 26, wherein each tool has a working face adapted to engage the tube, and the tool drives maintain the working faces of the tools in a mutually facing attitude throughout revolution of the tool carriers about their respective drive axes.

28. Apparatus according to claim 27, wherein each crank arm is rotatably driven at its drive end by a drive shaft which is journaled for rotation relative to a fixed shaft coaxial with said drive shaft and said drive axis, the tool carrier has a carrier shaft journaled for rotation at the free end of the crank arm for rotation about said tool carrier axis, and a timing mechanism operatively interconnects said carrier shaft and said fixed shaft to effect counter-rotation of the carrier shaft relative to the crank arm at the same angular rate so that the attitude of the tool relative to the processing path is fixed.

29. Apparatus according to claim 28, wherein said timing mechanism comprises an endless member interconnecting said carrier shaft and said fixed shaft.

30. Apparatus according to claim 29, wherein said endless member comprises a toothed belt, and said carrier shaft and said fixed shaft are notched to mate with said toothed belt.

31. Apparatus according to claim 24, further comprising a second pair of cyclically driven tools between which the tube passes as it moves along the processing path and which synchronously engage opposite faces of the tube and move at the same linear speed as the tube when in contact therewith, and return upstream to re-engage the advancing tube and repeat the processing cycle, each tool of said second pair being cantilevered transversely of the processing path from a tool drive located adjacent a second edge of the processing path which is opposite said first edge.

32. Apparatus according to claim 31, wherein each tool is mounted on a tool carrier, each tool drive comprises a crank arm having a drive end and a free end, each tool carrier is cantilevered at the free end of its respective crank arm, and the drive end of the crank arm is supported for rotation about a drive axis that extends transversely of the processing path.

33. Apparatus according to claim 32, wherein the drive axes for each set of two tools which act on the same face of the tube are coaxial so that said two tools of each said set travel in the same orbital path, and wherein the first and second pairs of tools are synchronously operated out of phase so that they engage the tube at different times and do not interfere with each other.

34. Apparatus according to claim 33, wherein said first and second pairs of tools are operated independently.

35. Apparatus according to claim 34, wherein said first and second pairs of tools are operated by separate servomotors.

36. Apparatus according to claim 33, wherein each tool carrier has a tool carrier axis about which the tool carrier rotates, and all of said tool carrier axes and said drive axes are parallel.

37. Apparatus according to claim 36, wherein the drive axes for each set of two tools which act on the same face of the tube are coaxial so that said two tools of each said set travel in the same orbital path, and wherein the first and second pairs of tools are synchronously operated out of phase so that they engage the tube at different times and do not interfere with each other.

38. Apparatus according to claim 37, wherein each tool has a working face adapted to engage the tube, each crank arm is rotatably driven at its drive end by a drive shaft which is journaled for rotation relative to a fixed shaft coaxial with the respective drive shaft and the respective drive axis, each tool carrier has a carrier shaft journaled for rotation at the free end of the respective crank arm for rotation about the respective tool carrier axis, and a timing mechanism operatively interconnects said carrier shaft and said fixed shaft to effect counter-rotation of the carrier shaft relative to the crank arm at the same angular rate so that the attitude of the tool relative to the processing path is fixed, whereby the working faces of each of said pairs of tools remain in a mutually facing attitude throughout revolution of the tool carriers about their respective drive axes.

39. Apparatus according to claim 38, wherein said timing mechanism comprises an endless member interconnecting said carrier shaft and said fixed shaft.

40. Apparatus according to claim 39, wherein said endless member comprises a toothed belt, and said carrier shaft and said fixed shaft are notched to mate with said toothed belt.

41. A bag forming and filling apparatus incorporating the processing apparatus of claim 24, which forms bags, dispenses product into the bags and seals them, wherein the tools are sealing tools which form the ends of the bags.

42. A bag forming and filling apparatus incorporating the processing apparatus of claim 31, which forms bags, dispenses product into the bags and seals them, wherein at least said first pair of tools are sealing tools which form the ends of the bags.